



(11)

EP 3 036 601 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
08.01.2020 Bulletin 2020/02

(51) Int Cl.:
G06F 3/0485 ^(2013.01) **G06T 3/20** ^(2006.01)
G06F 3/01 ^(2006.01)

(21) Application number: **13765759.9**

(86) International application number:
PCT/IB2013/001811

(22) Date of filing: **21.08.2013**

(87) International publication number:
WO 2015/025185 (26.02.2015 Gazette 2015/08)

(54) **VIDEO DISPLAY WITH PAN FUNCTION CONTROLLED BY VIEWING DIRECTION**

BILDSCHIRM MIT DURCH DIE BLICKRICHTUNG GESTEUERTER SCHWENKFUNKTION

DISPOSITIF D'AFFICHAGE DE VIDÉO AVEC PANORAMIQUE CONTRÔLÉE PAR LA DIRECTION
DE REGARD

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

(43) Date of publication of application:
29.06.2016 Bulletin 2016/26

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Description

Field of the Invention

[0001] The invention relates to a video display apparatus controlled by a viewer viewing direction.

Background of the Invention

[0002] "Pan & scan" (pan) is a term typically referred to cropping off horizontal sides of an original widescreen image having, for example, an aspect ratio of 2.35:1. Typically, pan may be used for fitting the most significant portion of the picture for display on, for example, a 16:9 aspect ratio display screen. The analogous cropping off in the vertical direction is typically referred to as "tilt & scan" (tilt). Zoom function may be used for better recognizing details. The zoom function may also be chosen for adapting pictures with different display ratio on the given screen from letterbox to different zoom modes. Different combinations of zoom, scan and tilt functions may be selected and controllable by a viewer using, for example, a conventional hand held remote-control unit.

[0003] The patent application US 2002/0105482 A1 discloses a system allowing the control of the user interface of a device with the users' head and eyes. It comprises the features of navigating between graphical elements and scrolling (pan/tilt functions) though the displayed information.

[0004] FIGURE 1a illustrates a picture 100 displayed on a display screen 106 without cropping and in a non-zoomed mode. In FIGURE 1b, a zoom function is applied to picture 100 such that only a picture portion 105a of picture 100 is displayed on display screen 106. In FIGURE 1b, portion 105a of picture 100 is zoomed center by having a center point 110 of display screen 106 at the same point as a center point 110' of picture 100. The zoom function results in a portion 105b of picture 100 being invisible for being outside the viewing area of screen 106. FIGURE 1c illustrates picture portion 105a, displayed on display screen 106 that results from applying a combination of both a zoom function and a pan function. As a result, center points 110 and 110' do not coincide. Similar symbols and numerals in FIGURES 1a, 1b and 1c indicate similar items or functions.

[0005] When a viewer is watching a movie on display screen 106 of FIGURE 1b, a particular object, not shown, may catch the viewer's attention. Such object may move in relation to screen 106 in a particular direction, for example, to the right of FIGURE 1b. Consequently, the viewer might tend to follow the moving object by changing the viewer's head direction and/or the direction to which the viewer's eyes are directed to the right of FIGURE 1b.

[0006] It may be desirable to employ a dynamically tracking pan function, a dynamically tracking tilt function or a combination thereof (each being referred herein as dynamically tracking pan/tilt function) responsive to the viewer head/eye movement. Such function may be used

in order to maintain the moving object within visible portion 105a instead of being invisible.

[0007] In carrying out an inventive feature, as long as the viewer's viewing direction is directed toward a center region of a display screen, dynamically tracking pan/tilt function is not performed or is disabled. Once the viewer's viewing angle crosses a first threshold angular direction, away from the screen center and towards, for example, a right side border of the screen, dynamically tracking pan function is enabled so as to shift the displayed picture in the opposite direction. The result is that the aforementioned moving object is shifted closer to the center of the screen. Advantageously, that portion of the zoomed picture that has been heretofore invisible will, consequently, shift into the viewing area of the display screen. Therefore, the moving object will, advantageously, tend to remain closer to the screen center.

[0008] Assume that, after the pan function is initiated, the viewer's viewing angular direction begins changing in the opposite direction. This may result, for example, because the moving object has shifted by the aforementioned picture shift operation of the pan function. It may be desirable to avoid a picture bounce in the vicinity of the first threshold angular direction.

[0009] In carrying out a further inventive feature, the viewer's viewing angular direction is required to cross a threshold angular direction that is smaller than the first threshold angular direction in order to suspend or stop further pan function operation. Thereby, advantageously, a hysteresis feature is incorporated into the pan/tilt function.

[0010] In carrying out another inventive feature, when the viewer's viewing angular direction crosses an even larger, second threshold angular direction away from screen center and towards the same side border of the screen, the picture will pan at a faster rate than when the viewer's viewing angular direction is between the first and second threshold angular directions. The faster rate is applied, advantageously, to prevent the moving object from disappearing from the visible portion of the screen.

[0011] The hysteresis feature can also be incorporated with respect to crossing the second threshold angular direction. Similarly, incorporating multiple thresholds and corresponding hysteresis features are also possible.

[0012] Assume that, after the picture shifting has stopped, the viewer turns the head in an opposite direction to that previously triggering the pan function. When the viewer's viewing angular direction exceeds a third threshold angular direction, pan function in the opposite direction is initiated.

[0013] In carrying out an even additional inventive feature, the third threshold angular direction is adaptably determined by the extent of the accumulation of the picture shifting present at the time the picture shifting stopped. Advantageously, a hysteresis feature may also be incorporated with respect to crossing the third threshold angular direction.

[0014] A sudden fast rate of change of the eye move-

ment, head-tracking or face orientation of the viewer might indicate a disturbance unrelated to the displayed picture. Therefore, in carrying out a further inventive feature, detection of such fast rate of change will have no effect on the pan/tilt function.

[0015] It may be desirable to complement the zoom or dynamically tracking pan/tilt function by making the perceived sources of sound such as speakers dynamically follow the dynamically tracking pan/tilt function. Advantageously, this is accomplished by adaptively mixing, for example, two stereo channels in response to control signals that control the pan/tilt function. Thus, as the displayed image shifts by the dynamically tracking pan/tilt function, the locations from which the sound is perceived to originate also track the display image to which the zoom or tracking pan/tilt function is applied. In short, the stereophonic width dynamically varies in accordance with the stereoscopic width.

[0016] An article entitled, THE SIMULATION OF MOVING SOUND SOURCES by John M. Chowning, (J. Audio Eng. Soc. 19, 2-6, 1971) describes an arrangement in which an illusory sound source can be moved through an illusory acoustical space. A number of independent audio channels is transformed into two or four channels where the location static or dynamic of each input channel can be independently controlled in an illusory environment. The method controls the distribution and amplitude of direct and reverberant signals between the loudspeakers.

[0017] United States Patent No. 5,046,097, Lowe, et al., describes a process to produce the illusion of distinct sound sources distributed throughout the three-dimensional space containing the listener, using conventional stereo playback equipment.

[0018] United States Patent No. 5,742,687 shows an embodiment for an audio-visual reproduction system in the form of, for example, a television set. In the case where a stereo audio signal is supplied, the position of the sound source that reproduces the left channel will present a virtual shift to the left. Similarly, the source representing the right channel signal will undergo a virtual shift to the right.

[0019] United States Patent No. 4,219,696, Takuyo Kogure et al., discloses mathematics which would allow placement of sound image anywhere in the plane containing the two loudspeakers and the listener's head, using modified stereo replay equipment with two or four loudspeakers. The system relies on accurate characterization, matching, and electrical compensation of the complex acoustic frequency response between the signal driving the loudspeaker and the sound pressure at each ear of the listener

[0020] United States Patent No. 4,524,451, Koji Watanabe, explains a basis for the creation of "phantom sound sources" lateral to or behind the listener.

[0021] United States Patent No. 5,987,141, Hoover, teaches a stereo expander in which stereophonic audio processing system having left and right stereophonic

sound channels with respective loudspeakers therefor is presented. The system is provided with spatial expansion of the stereophonic sound so that a first pair of spaced-apart loudspeakers will acoustically appear to be spaced further apart than they actually are.

Summary of the Invention

[0022] A video display apparatus includes a source of a video signal containing picture information of a picture to be displayed on a display screen and a sensor for sensing a viewing direction of a viewer with respect to the display screen. A processor is responsive to an output signal of the sensor and coupled to the display screen for applying a pan/tilt function to the displayed picture to shift the displayed picture with respect to the display screen.

[0023] In carrying out an inventive feature, the displayed picture is shifted when the viewing direction crosses, in a first direction, a first threshold direction. A change is produced in the picture shifting when the viewing direction crosses, in a direction opposite to the first direction, a second threshold direction in a manner to provide hysteresis.

[0024] In carrying out another inventive feature, the displayed picture is shifted at a first rate and in a first direction after the viewing direction crosses a first threshold direction. The displayed picture is further shifted in the same direction at a different, second rate, after the viewing direction crosses, in the first direction, a second threshold direction.

[0025] In carrying out a further inventive feature, the picture is shifted with respect to the display screen in a first direction when the viewing direction is within a first range of values. Additional picture shifting ceases when the viewing direction is within a second range of values. The picture is shifted in the opposite direction when the viewing direction crosses a first threshold direction. The first threshold direction is adaptively adjusted in accordance with a magnitude of the picture shift accumulated prior to a time when the additional picture shifting has ceased.

[0026] In carrying out an even further inventive feature, the processor is further responsive to content of the picture for varying the picture shift previously obtained in response to a change in the displayed picture content.

Brief Description of the Drawings

[0027] The preferred embodiment of the present invention will be described below in more detail with reference to the accompanying drawings in which:

FIGURE 1a illustrates in a front view a picture displayed on a display screen without cropping and in non-zoomed mode, in accordance with the prior art;

FIGURE 1b illustrates in a front view a picture dis-

played on a display screen when a zoom function is applied to the picture, in accordance with the prior art;

FIGURE 1c illustrates in a front view a picture portion displayed on the display screen when both a zoom function and a pan function are applied, in accordance with the prior art;

FIGURE 2 illustrates a block diagram of a system, embodying an inventive feature;

FIGURES 3a and 3b illustrate, each, a pair of cameras for sensing viewer viewing direction and for controlling the arrangement of FIGURE 2;

FIGURES 4a, 4b, 4c and 4d illustrate, each, a top view of a display screen viewed by a viewer, for explaining the operation of the system of FIGURE 2;

FIGURES 5a and 5b illustrate, each, a front view of display screen for explaining the operation of the system of FIGURE 2; and

FIGURE 6 illustrates a block diagram of a portion of an audio processor of FIGURE 2 that performs a virtual audio shift of a pair of stereo audio channels in response to an output of the cameras of FIGURES 3a and 3b.

Detailed Description

[0028] FIGURE 2 illustrates a block diagram of a system 150, embodying an inventive feature. Similar symbols and numerals in FIGURES 1a, 1b, 1c and 2 indicate similar items or functions.

[0029] System 150 of FIGURE 2 includes an input video/audio source 156 that applies a video containing portion of an input video/audio signal 156a to a video processor 155 and an audio containing portion of input video/audio signal 156a to an enhanced audio processor 157. Video processor 155 derives picture information and enhanced audio processor 157 derives audio information from the corresponding portions of video/audio signal 156a in a conventional manner.

[0030] A zoom, pan/tilt function controller 154 is responsive to a signal 180a produced in a conventional way in a viewer interface and remote control 180. Controller 154 generates a signal 154a that is applied to video processor 155. Video processor 155 applies in a conventional manner a conventional zoom or pan/tilt function in a conventional video display 159 in accordance with viewer's initiated commands via interface and remote control 180. Video processor 155 generates an output video signal 155a for driving video display 159.

[0031] Each of FIGURES 3a and 3b illustrates schematically a top view of a pair of cameras 152 of system 150 of FIGURE 2 mounted in the vicinity of the left and right sides, respectively, of display screen 106 of FIG-

URES 3a and 3b. Similar symbols and numerals in FIGURES 1a-1c, 2, 3a and 3b indicate similar items or functions. Cameras 152 of FIGURES 3a and 3b provide together, stereoscopic picture information that enables a conventional processor for sensing viewing direction 151 to sense viewing direction 161 of a viewer 160. In the example of FIGURE 3a, viewing angular direction 161 is perpendicular to display screen 106 of video display 159. On the other hand, viewing angular direction 161 in the example of FIGURE 3b is directed to the extreme right side of display screen 106.

[0032] Cameras 152 of FIGURE 2 generate a pair of output signals 152a are applied to processor for sensing viewing direction 151 for sensing at least one of face, head or eyes position of viewer 160 of FIGURES 3a and 3b with respect to display screen 106. A single stereoscopic camera can be used instead of the pair of cameras 152. Also, a non- stereoscopic single camera with enhanced processing of face or eye movement detection can be used instead of pair cameras 152. Processor for sensing viewing direction 151 of FIGURE 2 generates in a conventional manner an output signal 151a that is indicative of a present viewing direction of viewer 160 of FIGURES 3a and 3b.

[0033] In carrying out function controller 154 of FIGURE 2 is responsive to output signal 151a for generating control signal 154a. Control signal 154a produced in controller 154 is applied to video processor 155 in a manner to produce dynamically tracking pan/tilt function.

[0034] FIGURES 5a and 5b are similar to FIGURES 1b and 1c, respectively, except as explained later on. Each of FIGURES 5a and 5b shows a horizontal line 110a extending through screen center 110 for explanation purposes. FIGURES 4a, 4b, 4c and 4d collectively depict a direction 161a1, a direction 161a, a direction 161b1, a direction 161b, a direction 161a' and a direction 161b'. Each of directions 161a1, 161a, 161b1, 161b, 161a' and 161b' intersects, for example, in a spot 161a1, a spot 161a, a spot 161b1, a spot 161b, a spot 161a' and a spot 161b', respectively, disposed in a horizontal direction along, for example, horizontal line 110a of FIGURES 5a and 5b. In FIGURES 5a and 5b, intersection spots 161a1 and 161b1 have been omitted. Similar symbols and numerals in FIGURES 1a-1c, 2, 3a, 3b, 4a-4d, 5a and 5b indicate similar items or functions.

[0035] In FIGURE 4a, picture 100 is initially zoomed center in a way similar to that explained with respect to FIGURE 1b or 5a. Assume that, when picture 100 is initially zoomed center, as in FIGURE 4a, an object, not shown, that is displayed in display screen 106 in visible portion 105a of FIGURE 5a, moves in a horizontal direction parallel to horizontal line 110a towards a side edge 111 of screen 106 that is at the right of each of FIGURES 4a, 4b, 4c and 4d. Also assume that, when picture 100 is zoomed center, viewer 160 turns the head or eyes to the right side of FIGURE 4a that is the left side with respect to viewer 160, for the purpose of, for example, following the moving object.

[0036] As long as a viewing angular direction of viewer 160 is within an angular range that is smaller than threshold angular direction 161a, dynamically tracking pan function is not applied or is disabled. When viewer 160 viewing angular direction crosses threshold angular direction 161a of FIGURE 4b or, in other words, when a difference between viewer 160 viewing angular direction and threshold angular direction 161a changes polarity, dynamic tracking pan function is applied so as to shift picture 100 gradually to the left of FIGURE 4b at a slow first rate.

[0037] In carrying out an inventive feature, after crossing threshold angular direction 161a and as long as viewer 160 viewing angular direction remains at an angular direction that is larger than a hysteresis providing threshold angular direction 161a1, dynamically tracking pan function is further applied so that picture 100 additionally shifts to the right with respect to viewer 160 that is to the left of FIGURE 4b, as indicated by the direction of an arrow 173. Threshold angular direction 161a1 is slightly smaller than angle 161a for providing hysteresis that, advantageously, prevents picture back and forth bouncing.

[0038] In carrying out an additional inventive feature, when viewer 160 viewing angular direction becomes larger than a threshold angular direction 161b of FIGURE 4c or, in other words, when a difference between viewer 160 viewing angular direction and threshold angular direction 161b changes polarity, additional shifting continues but, advantageously, at a faster rate than in the range between angular directions 161a1 and 161b. Similarly to the threshold feature discussed before, after crossing threshold 161b shifting picture 100 will progress at the relatively faster rate, as long as viewer 160 maintains a viewing angular direction that is larger than a threshold angular direction 161b1. Threshold angular direction 161b1 is slightly smaller than threshold angular direction 161b in a manner to provide hysteresis. Should viewer 160 viewing angle become smaller than hysteresis providing threshold angular direction 161b1 but larger than threshold angular 161a1 of FIGURE 4b, additional shifting of picture 100 would revert to the slower rate that existed immediately prior to crossing threshold angular direction 161b of FIGURE 4c. When the viewing angular direction of viewer 160 becomes smaller than threshold angular direction 161a1 of FIGURE 4b, additional shifting of picture 100 ceases and shifting picture 100 is held in suspense in the same shifted or pan state accumulated immediately prior to crossing threshold angular direction 161a1.

[0039] As a result of, for example, the previously discussed shift of picture 100 to the left of FIGURE 4c, viewer 160 is likely to turn the head in the opposite direction that is to the right of viewer 160, as shown in FIGURE 4d. Threshold angular direction 161a' extends from perpendicular direction line 172 towards the left side of line 172. As long the viewing angular direction of as viewer 160 is within an angular range that is smaller than threshold angular direction 161a', any change in shifting of picture

100 remains suspended, as explained before. On the other hand, should viewer 160 viewing angular direction exceed or cross threshold angular direction 161a', dynamically tracking pan function would apply in the opposite direction for shifting picture 100 to the right of FIGURE 4d that is to the left with respect to viewer 160 or towards center 110 of display screen 106, as shown by an arrow 174. Except as further explained, the aforementioned features associated with, for example, angular directions 161a, and 161b are similarly applicable to angular directions 161a' and 161b', respectively, that are located at the left side of perpendicular direction line 172.

[0040] In carrying out an inventive feature, the magnitude of, for example, each of threshold angular directions 161a' and 161b' of FIGURE 4d varies adaptably in accordance with the amount of pre-existing shifting of picture 100 that has accumulated until the additional shifting of picture 100 to the left side of FIGURE 4c has been accumulated and held in suspense.

[0041] It should be understood that the features that are described later on with respect to FIGURES 4a-4d, are symmetrically applicable to a symmetrical situation in which the object, not shown, displayed in display screen 106 in portion 105a of FIGURE 5a, moves along horizontal line 110a, instead, towards a side edge 112 of screen 106 that is at the left of each of FIGURES 4a, 4b, 4c and 4d when picture 100 is zoomed center. For example, in FIGURE 4a, angular directions 161a' and 161b' are equal to angular directions 161a and 161b, respectively.

[0042] On the other hand, advantageously, the magnitude of each of threshold angular directions 161a' and 161b' of FIGURE 4d, that is applicable to the situation, described before with respect to FIGURE 4d, in which pre-existing shifting of picture 100 is present, the magnitude of each of angular directions 161a' and 161b' is smaller than in FIGURE 4a, respectively. This feature, advantageously, facilitates a quick return to the non-shifted, zoomed center of picture 100 of FIGURE 4a.

[0043] Dynamically tracking tilt function is performed in an analogous way to dynamically tracking pan function. In implementing the dynamically tracking pan function, picture shift occurs in the horizontal direction, as explained before; whereas in implementing the dynamically tracking tilt function, picture shift occurs in the vertical direction. Also, it should be understood that, instead of having pan/tilt function that changes at discrete threshold angular directions, changes in the pan/tilt function can occur in a non-discrete continuous manner angular directions.

[0044] Each of FIGURES 5a and 5b depicts a perimeter 261a and a perimeter 261b. Perimeter 261a includes threshold angular directions 161a and 161a' in the horizontal direction of horizontal line 110a. Similarly, perimeter 261b includes threshold angular directions 161b and 161b'. A corresponding portion of each of perimeter 261a and 261b also includes threshold angular directions that are associated with initiating shifting of picture 100 in the

vertical direction to provide dynamically tracking tilt function.

[0045] In FIGURE 5a, picture 100 is zoomed centered. Therefore, perimeters 261a and 261b are symmetrical in the horizontal direction with respect to center 110. On the other hand, in FIGURE 5b, picture 100 is already pre-shifted. Therefore, perimeters 261a and 261b are asymmetrical in the horizontal direction with respect to center 110 in a manner to provide adaptable dynamically tracking pan function, as explained before.

[0046] Assume that when picture 100 is shifted such as in, for example, in FIGURE 5b, the scene depicted in picture 100 abruptly changed so that the aforementioned moving object is no longer relevant to viewer 160 of FIGURE 3a or 3b. Advantageously, video processor 155 of FIGURE 2 includes a detector, not shown, responsive to video/audio signal 156a for detecting the occurrence of the scene change to generate a reset signal 155b that is coupled to zoom, pan/tilt function controller 154 for overriding the accumulated shifting of picture 100 of FIGURE 5b in a manner to center picture 100 as in FIGURE 5a. This feature, advantageously, facilitates a quick return to the non-shifted centered picture 100 of FIGURE 4a upon the occurrence of a scene change.

[0047] FIGURE 6 depicts a console 300 that is included in audio processor 157 of FIGURE 2. Similar symbols and numerals in FIGURES 1a-1c, 2, 3a, 3b, 4a-4d, 5a, 5b and 6 indicate similar items or functions. Console 300 of FIGURE 6 receives a pair of stereo audio channels, 138 and 139. Channels 138 and 139 are derived in a conventional manner, not shown, in audio processor 157 from video/audio signal 156a of FIGURE 2.

[0048] Channel 138 of FIGURE 6 is applied through three parallel signal paths to an audio mixer 304. It is delayed in a delay 301 to produce a delayed signal 301a; it is filtered in a filter 302 to produce a filtered signal 302a and it is reverbed in a reverb stage 303 to produce a reverbed signal 303a. Similarly, channel 139 is applied through three parallel signal paths to an audio mixer 304'. It is delayed in a delay 301' to produce a delayed signal 301a'; it is filtered in a filter 302' to produce a filtered signal 302a' and it is reverbed in a reverb stage 303' to produce a reverbed signal 303a'. Mixer 304 combines signals 301a, 302a, 303a, 301a', 302a' and 303a' to generate output signal 157a for driving speaker 158a. Mixer 304' also combines signals 301a, 302a, 303a, 301a', 302a' and 303a' to generate output signal 157b for driving speaker 158b. As explained before, it is well known to process a pair of stereo signals such as channels 138 and 139 in such a way that the sound produced by speakers such as 158a and 158b appears to a viewer/listener as being originated in locations, shifted relative to where the actual speakers are physically located.

[0049] Advantageously, output signal 154a that controls zoom, pan/tilt function, as explained before, is also applied to a programmable logic array (PLA) 305 for producing a set of coefficients 305a that are collectively applied to delay 301, filter 302, reverb stage 303 and mixer

304. PLA 305 also produces, a second set of coefficients 305b that are collectively applied to delay 301', filter 302', reverb stage 303' and mixer 304'. Advantageously, in the arrangement of FIGURE 6, coefficients 305a and 305b change dynamically in accordance with signal 154a to produce dynamic virtual shift of the sound sources. For obtaining a corresponding virtual sound source shift, coefficients 305a and 305b dynamically vary in accordance with the present shift of picture 100 of FIGURES 4a-4d.

[0050] Advantageously, signals 157a and 157b of FIGURES 2 and 6 generated by enhanced audio processor 157 drive loudspeakers 158a and 158b, respectively, in a manner to make viewer 160 of FIGURES 4a-4d perceive the sound produced in loudspeakers 158a and 158b of FIGURE 2 as dynamically changing in accordance with the dynamically tracking pan/tilt function. It should be understood that this arrangement is not limited to a pair of speakers but may include systems like the surround sound speakers or the like.

[0051] Thus, as the displayed image shifts by the dynamically tracking pan/tilt function, the locations from which the sound sources are perceived to originate also follow the shifted or zoomed displayed image to form virtual shift of the sound. Coefficients 305a and 305b of FIGURE 6 that are required for each selected virtual shift of loudspeakers 157 and 158 can be programmed prior to installation or use by computation according to the teaching of the prior art and/or by experimentation that might consider the size of a room containing loudspeakers 157 and 158. As signal 154a change, the selection of coefficients 305a and 305b of FIGURE 5 change in a dynamic manner.

Claims

1. A video display apparatus (150), comprising:

- a screen (159) configured to display a video signal
- an input (156) configured to receive an audio/video signal containing at least picture information of a picture to be displayed on the screen;
- a processor (151) configured to sense a viewing direction of a viewer with respect to said display screen;
- a video processor (155) configured to:

- perform a zooming function on the received video signal;
- detect the occurrence of a scene change in said received video signal and generate a reset signal (155b) if a scene change is detected; and
- modify said received video signal by applying a pan and tilt function according to a control signal (154a) obtained from a controller (154) and provide said modified video

- signal to the screen (159); and
- the controller (154) responsive to an output signal of said processor (151) and to an output signal of the video processor (155), configured to:
- 5 determine the pan and tilt function to be applied with respect to said viewing direction sensed by the processor (151) to track the viewer's viewing angle and wherein, upon detection of the occurrence of a scene change; and
 - 10 center the picture of the audio/video signal when receiving the reset signal (155b).
2. The apparatus according to Claim 1 wherein the dynamic tracking of the pan/tilt function is disabled until the viewer's viewing angle crosses a first threshold angular direction (161a).
 3. The apparatus according to any of claims 1 or 2 wherein the controller is further configured to, when said viewing direction crosses, in a first movement, a first threshold angular direction (161a) until said viewing direction crosses, in a movement opposite to said first movement, a second threshold angular direction (161a1) smaller than the first angular direction threshold (161a) in a manner to provide hysteresis, determine pan and tilt function so as to shift picture according to a first rate.
 4. The apparatus according to claim 3 wherein the controller is further configured to, when said viewing direction crosses a third threshold angular direction (161b) greater than the first angular direction threshold (161a) wherein said third threshold angular direction corresponds to a viewing direction that is closer to an edge of said screen than said viewing direction that corresponds to said first threshold angular direction, determine pan and tilt function so as to shift picture according to a rate faster than the first slower rate.
 5. The apparatus according to Claim 4 wherein said processor causes said faster rate to change to said first slower rate when said viewing direction crosses a fourth threshold direction (161b1) smaller than the third angular direction threshold (161b), in a direction opposite to said first direction, in a manner to provide hysteresis.
 6. The apparatus of any of claims 1 to 5 further comprising an audio processor (157) configured to:
 - 55 modify the received audio signal comprising a plurality of audio channels by applying delay (301), filter (302) and reverberation (303) functions to the audio channels and mix (304) the

modified audio channels together in order to localize the sound in relation to the video panning, wherein the modifications are performed according to the control signal (154a) provided by the controller (154) and representative of a pan and tilt function and;

provide said modified audio signal to speakers (158).

7. The apparatus of claim 5 adapted to receive a pair of stereo audio channels.

Patentansprüche

1. Videoanzeigevorrichtung (150), die umfasst:

einen Bildschirm (159), der dafür konfiguriert ist, ein Videosignal anzuzeigen,

einen Eingang (156), der dafür konfiguriert ist, ein Audio/Video-Signal zu empfangen, das mindestens Bildinformationen eines auf dem Bildschirm anzuzeigenden Bilds enthält;

einen Prozessor (151), der dafür konfiguriert ist, eine Blickrichtung eines Betrachters in Bezug auf den Anzeigebildschirm zu erfassen;

einen Videoprozessor (155), der konfiguriert ist zum:

Ausführen einer Zoom-Funktion an dem empfangenen Videosignal,

Detektieren des Auftretens eines Szenenwechsels in dem empfangenen Videosignal und Erzeugen eines Rücksetzsignals (155b), falls ein Szenenwechsel detektiert wird; und

Ändern des empfangenen Videosignals durch Anwenden einer Schwenk- und Neigefunktion gemäß einem von einem Controller (154) erhaltenen Steuersignal (154a) und Bereitstellen des geänderten Videosignals für den Bildschirm (159); und

wobei der Controller (154) als Reaktion auf ein Ausgangssignal des Prozessors (151) und auf ein Ausgangssignal des Videoprozessors (155) dafür konfiguriert wird, die Schwenk- und Neigefunktion zu bestimmen, die in Bezug auf die durch den Prozessor (151) erfasste Blickrichtung angewendet werden soll, um den Blickwinkel des Betrachters nachzuführen, und wobei das Bild des Audio/Video-Signals zentriert werden soll nach Empfang des Rücksetzsignals (155b).

2. Vorrichtung nach Anspruch 1, wobei die dynamisch nachführende Schwenk/Kipp-Funktion gesperrt wird, bis der Blickwinkel des Betrachters eine erste

Schwellenwinkelrichtung (161a) überquert.

3. Vorrichtung nach einem der Ansprüche 1 oder 2, wobei der Controller ferner dafür konfiguriert ist, die Schwenk- und Neigefunktion in der Weise zu bestimmen, dass das Bild gemäß einer ersten Geschwindigkeit verschoben wird, wenn die Blickrichtung in einer ersten Bewegung eine erste Schwellenwinkelrichtung (161a) überquert, bis die Blickrichtung in einer entgegengesetzten Bewegung zu der ersten Bewegung eine zweite Schwellenwinkelrichtung (161a1), die in einer Weise, dass eine Hysterese bereitgestellt wird, kleiner als der erste Winkelrichtungsschwellenwert (161a) ist, überquert.

4. Vorrichtung nach Anspruch 3, wobei der Controller ferner dafür konfiguriert ist, die Schwenk- und Neigefunktion in der Weise zu bestimmen, dass das Bild gemäß einer höheren Geschwindigkeit als der ersten, niedrigeren Geschwindigkeit verschoben wird, wenn die Blickrichtung eine dritte Schwellenwinkelrichtung (161b) überquert, die größer als der erste Winkelrichtungsschwellenwert (161a) ist, wobei die dritte Schwellenwinkelrichtung einer Blickrichtung entspricht, die näher einem Rand des Bildschirms als die Blickrichtung, die der ersten Schwellenwinkelrichtung entspricht, ist.

5. Vorrichtung nach Anspruch 4, wobei der Prozessor in einer Weise, dass eine Hysterese bereitgestellt wird, veranlasst, dass die höhere Geschwindigkeit zu der ersten, niedrigeren Geschwindigkeit wechselt, wenn die Blickrichtung in einer Richtung, die zu der ersten Richtung entgegengesetzt ist, eine vierte Schwellenrichtung (161b1) überquert, die kleiner als der dritte Winkelrichtungsschwellenwert (161b) ist.

6. Vorrichtung nach einem der Ansprüche 1 bis 5, die ferner einen Audioprozessor (157) umfasst, der konfiguriert ist zum:

Ändern des empfangenen Audiosignals, das mehrere Audiokanäle umfasst, durch Anwenden einer Verzögerungs- (301), einer Filter- (302) und einer Nachhall- (303) Funktion auf die Audiokanäle und Mischen (304) der geänderten Audiosignale miteinander, um den Schall in Bezug auf den Videoschwenk zu lokalisieren, wobei die Änderungen gemäß dem durch den Controller (154) bereitgestellten Steuersignal (154a) ausgeführt werden und eine Schwenk- und Neigefunktion repräsentieren; und
Bereitstellen des geänderten Audiosignals für Lautsprecher (158).

7. Vorrichtung nach Anspruch 5, die dafür ausgelegt ist, ein Paar der Stereoaudiokanäle zu empfangen.

Revendications

1. Appareil d'affichage vidéo (150), comprenant :

un écran (159) configuré pour afficher un signal vidéo ;
une entrée (156) configurée pour recevoir un signal audio/vidéo contenant au moins une information d'image d'une image à afficher sur l'écran ;
un processeur (151) configuré pour détecter une direction de visualisation d'un spectateur par rapport audit écran d'affichage ;
un processeur vidéo (155) configuré pour :

exécuter une fonction de zoom sur le signal vidéo reçu ;
détecter un changement de scène dans ledit signal vidéo reçu et générer un signal de réinitialisation (155b) si un changement de scène est détecté ; et
modifier ledit signal vidéo reçu en appliquant une fonction de panoramique et d'inclinaison d'après un signal de commande (154a) obtenu d'un dispositif de commande (154) et fournir ledit signal vidéo modifié à l'écran (159) ; et

le dispositif de commande (154) réagissant à un signal de sortie dudit processeur (151) et à un signal de sortie du processeur vidéo (155), configuré pour :

déterminer la fonction de panoramique et d'inclinaison à appliquer par rapport à ladite direction de visualisation détectée par le processeur (151) pour suivre l'angle de visualisation du spectateur et
centrer l'image du signal audio/vidéo après réception du signal de réinitialisation (155b).

2. Appareil selon la revendication 1, dans lequel la fonction de panoramique/d'inclinaison de suivi dynamique est désactivée jusqu'à ce que l'angle de visualisation du spectateur croise une première direction angulaire seuil (161a).

3. Appareil selon l'une quelconque des revendications 1 ou 2, dans lequel le dispositif de commande est en outre configuré pour, lorsque ladite direction de visualisation croise, dans un premier mouvement, une première direction angulaire seuil (161a) jusqu'à ce que ladite direction de visualisation croise, dans un mouvement opposé audit premier mouvement, une deuxième direction angulaire seuil (161a1) inférieure à la première direction angulaire seuil (161a) de sorte à produire une hystérésis, déterminer la

fonction de panoramique et d'inclinaison de sorte à décaler l'image selon une première vitesse.

4. Appareil selon la revendication 3, dans lequel le dispositif de commande est en outre configuré pour, lorsque ladite direction de visualisation croise une troisième direction angulaire seuil (161b) supérieure à la première direction angulaire seuil (161a) où ladite troisième direction angulaire seuil correspond à une direction de visualisation plus proche d'un bord dudit écran que ladite direction de visualisation qui correspond à ladite première direction angulaire seuil, déterminer la fonction de panoramique et d'inclinaison de sorte à décaler l'image selon une vitesse plus rapide que la première vitesse plus lente.

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5. Appareil selon la revendication 4, dans lequel ledit processeur entraîne un passage de ladite vitesse plus rapide à ladite première vitesse plus lente lorsque ladite direction de visualisation croise une quatrième direction seuil (161b1) inférieure à ladite troisième direction angulaire seuil (161b), dans une direction opposée à ladite première direction, de manière à produire une hystérésis.

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6. Appareil selon l'une quelconque des revendications 1 à 5, comprenant en outre un processeur audio (157) configuré pour :

modifier le signal audio reçu comprenant une pluralité de canaux audio en appliquant des fonctions de retard (301), de filtre (302) et de réverbération (303) aux canaux audio et mélanger (304) les canaux audio modifiés pour localiser le son par rapport au panoramique vidéo, où les modifications sont effectuées d'après le signal de commande (154a) fourni par le dispositif de commande (154) et représentatif d'une fonction de panoramique et d'inclinaison et ;

fournir ledit signal audio modifié aux haut-parleurs (158).

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7. Appareil selon la revendication 5 adapté pour recevoir une paire de canaux audio stéréo.

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FIG. 1A

PRIOR ART

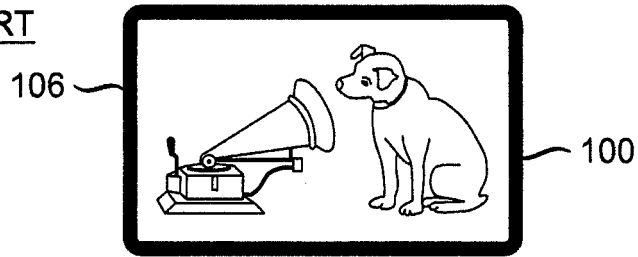


FIG. 1B

PRIOR ART

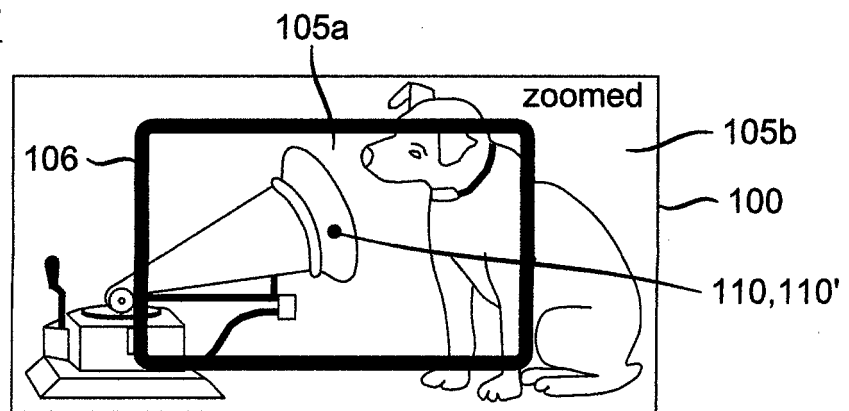
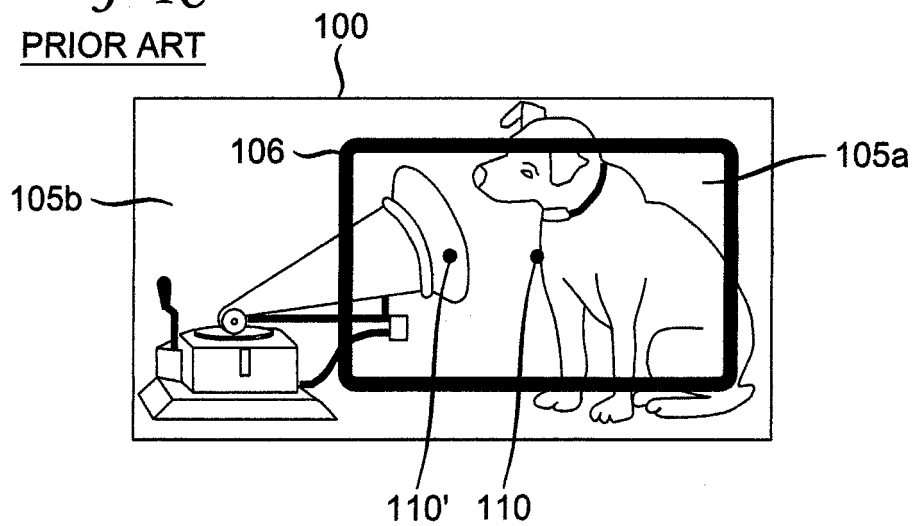


FIG. 1C

PRIOR ART



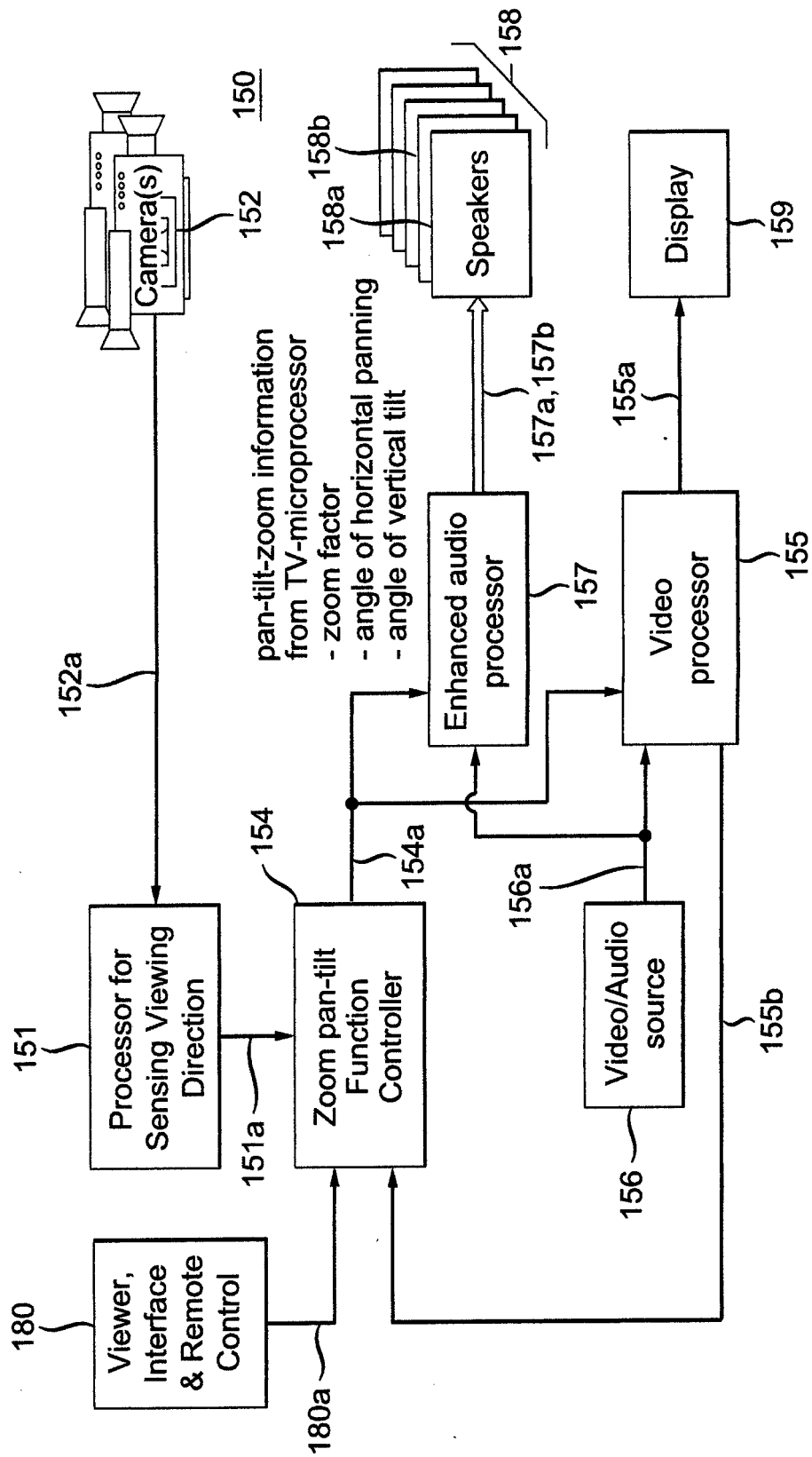


FIG. 2

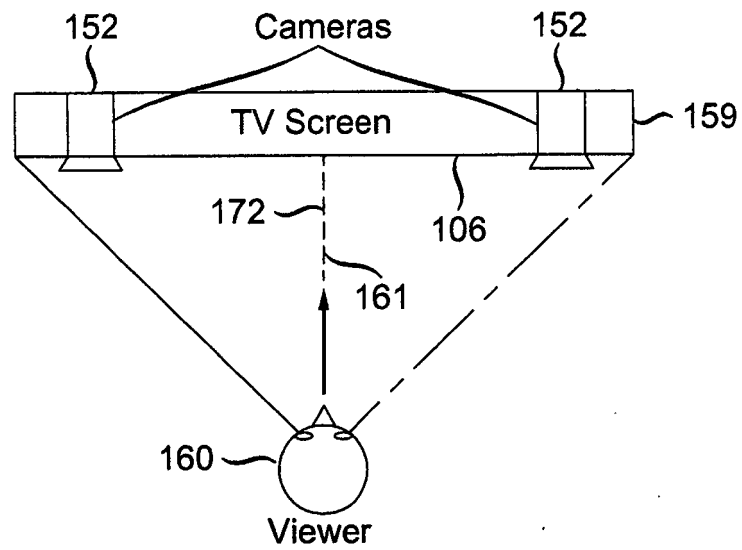


FIG. 3A

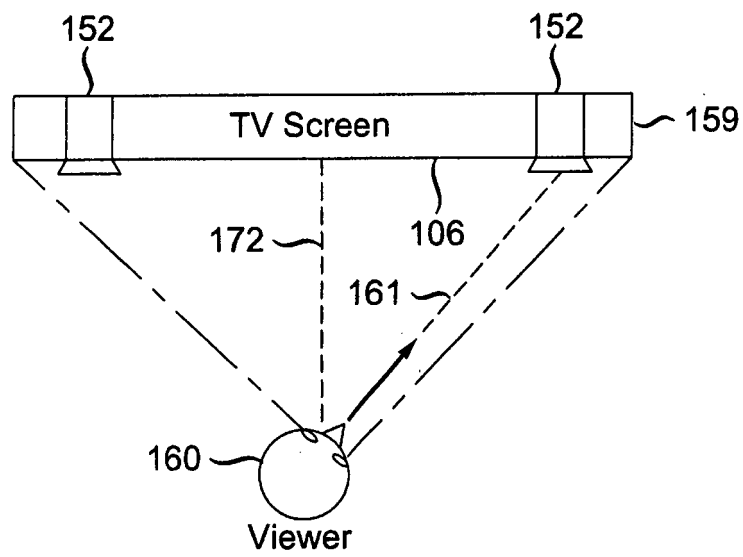


FIG. 3B

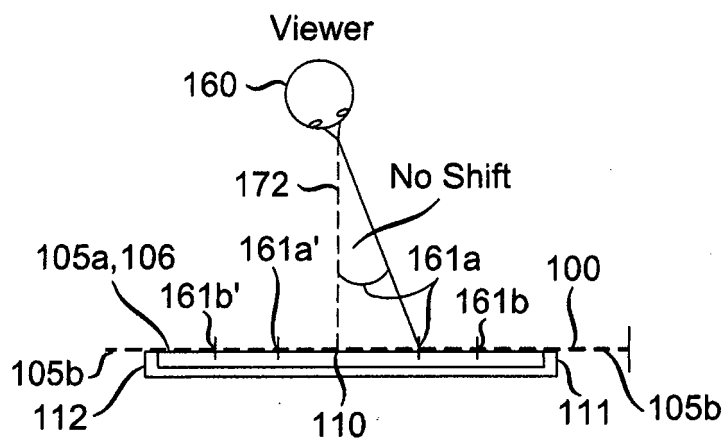


FIG. 4A

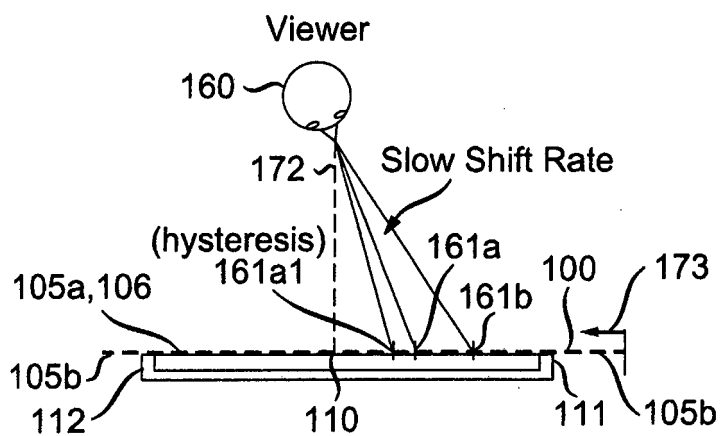


FIG. 4B

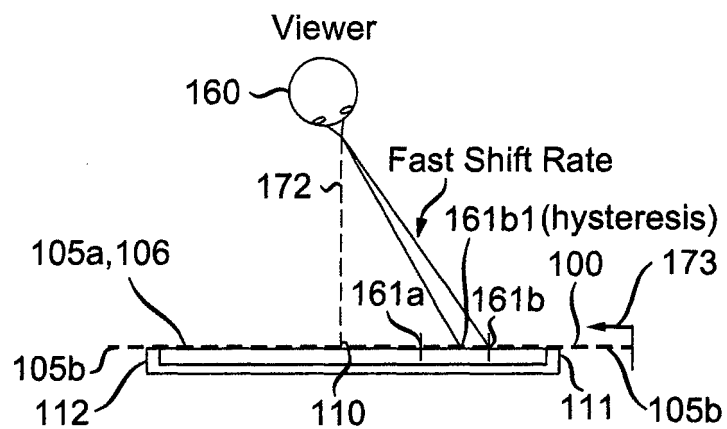


FIG. 4C

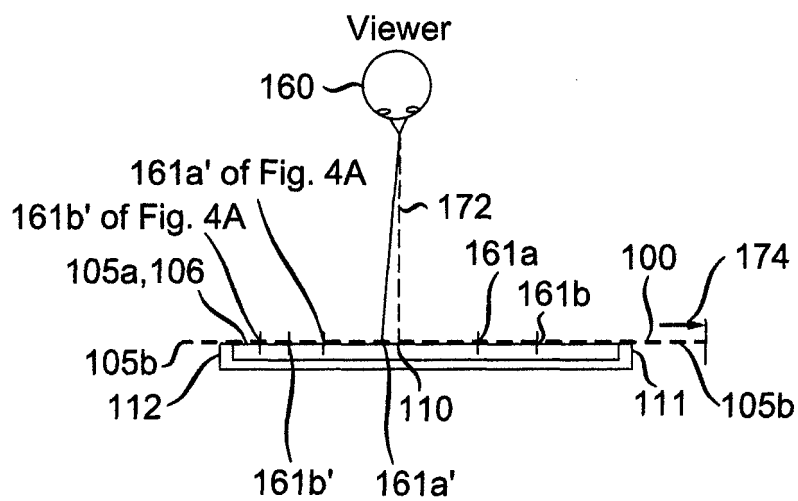


FIG. 4D

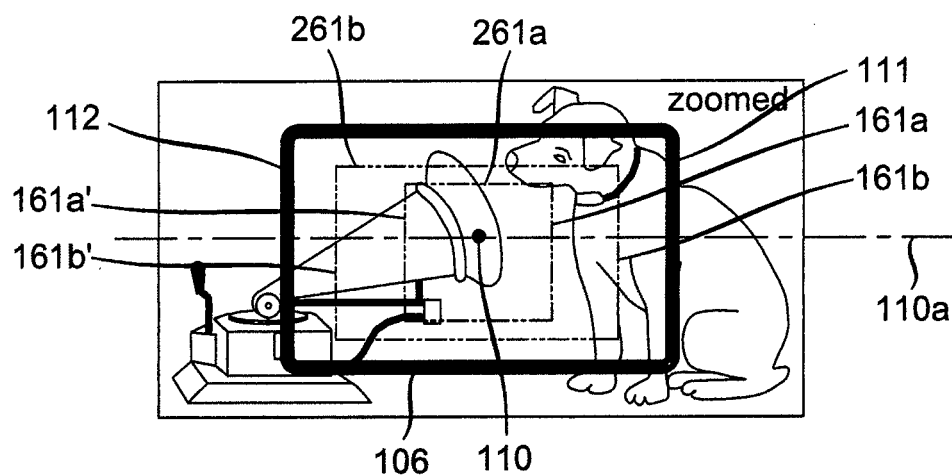


FIG. 5A

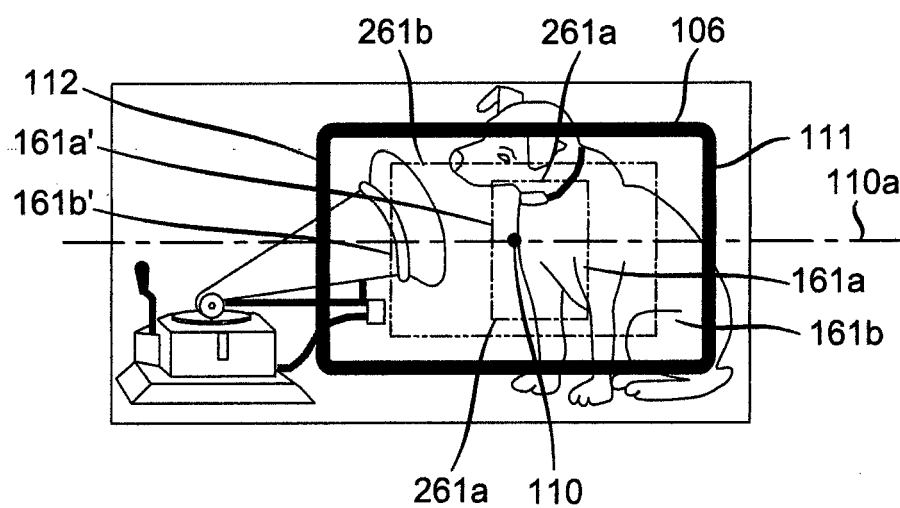


FIG. 5B

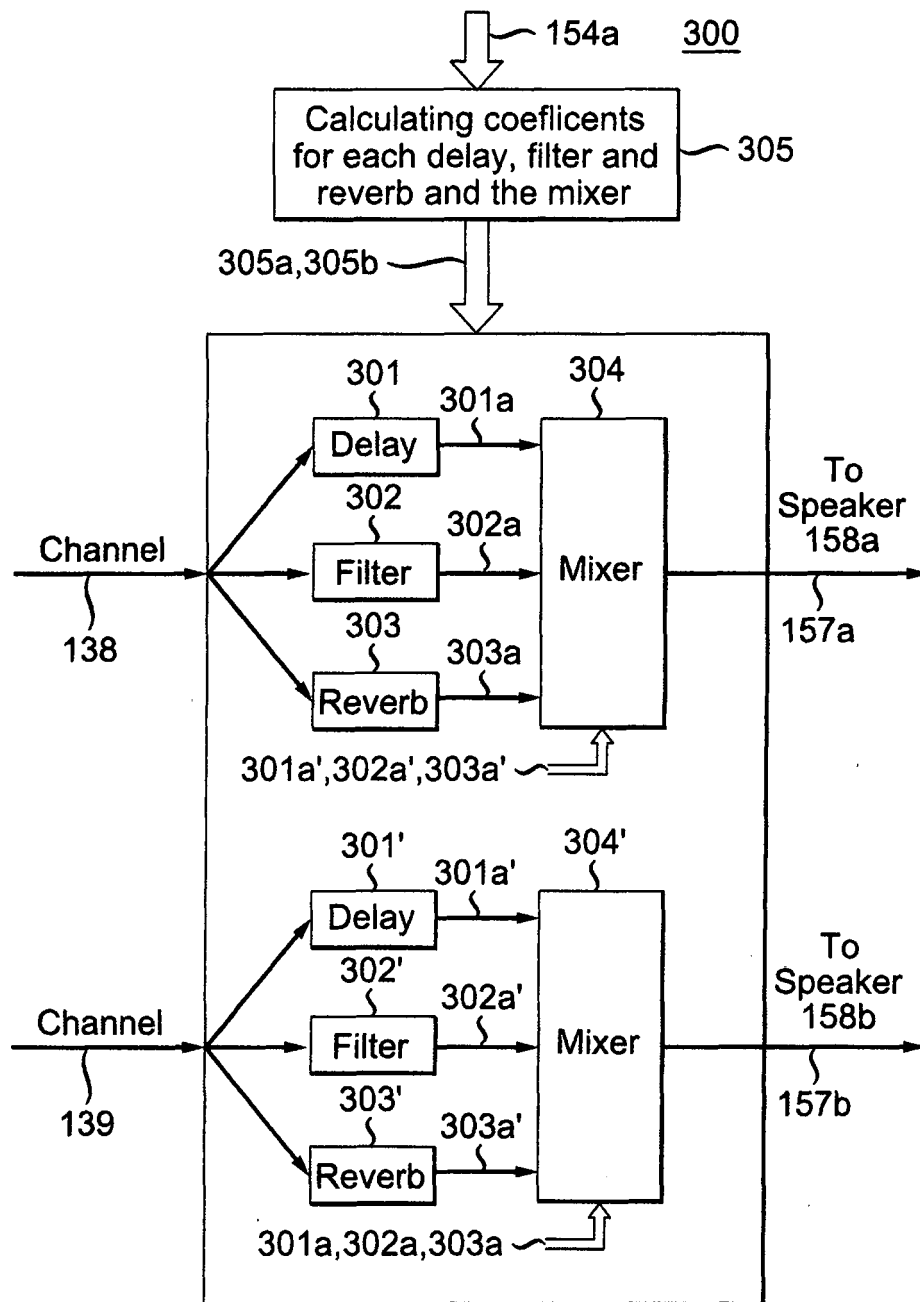


FIG. 6

REFERENCES CITED IN THE DESCRIPTION

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